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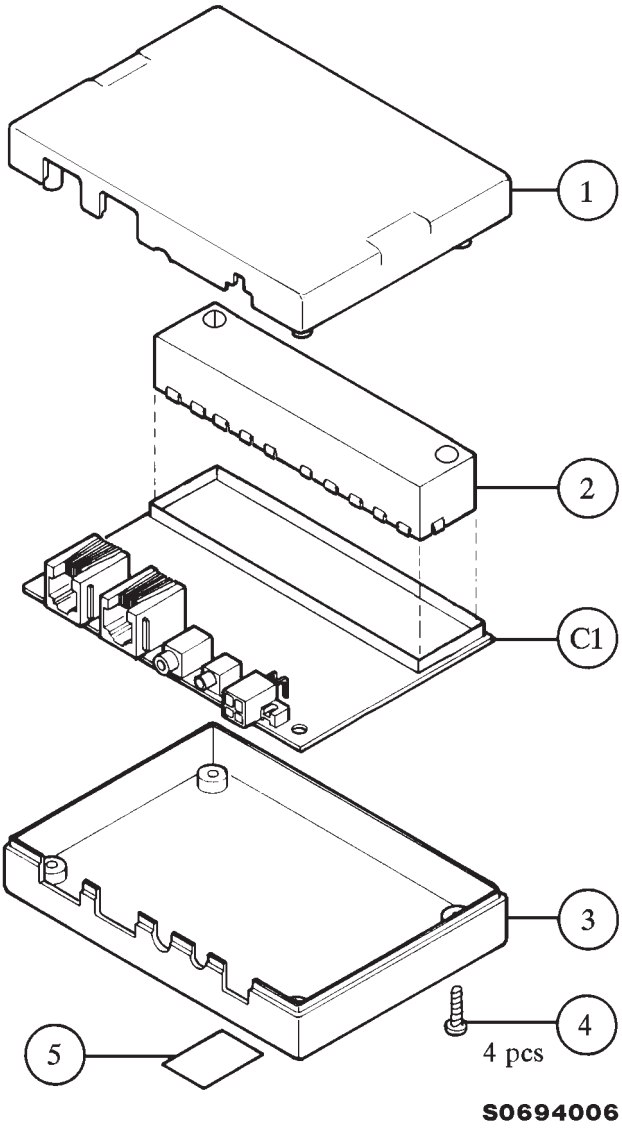
Exploded View



Assembly Parts

ITEM	Q'TY	CODE	DESCRIPTION	VALUE, TYPE
1		9450067	Cover	1D 21307
2		9510078	EMC cover	3D 21558
3		9450066	Bottom cover	1D 21305
4	4	6292014	PT screw	KB25x16 FeZn
5			Type label HFJ–3	
C1		0200180	BC4B junction module	

V271	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V272	4110195	Zener diode	BZX84	5 % 18 V 0.3 W SOT23
V274	4200603	Transistor	BCX17	pnp 45 V 500 mA SOT23
V292	4107160	Zener diode	BZX84	5 % 12 V 0.3 W SOT23
V293	4106769	Zener diode	BZX84	5 % 4.7 V 0.3 W SOT23
V311	4106769	Zener diode	BZX84	5 % 4.7 V 0.3 W SOT23
V312	4106769	Zener diode	BZX84	5 % 4.7 V 0.3 W SOT23
V340	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V341	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V342	4200909	Transistor	BC858B/BCW30	pnp 30 V 100 mA SOT23
V343	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V344	4200909	Transistor	BC858B/BCW30	pnp 30 V 100 mA SOT23
V345	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V346	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V347	4107160	Zener diode	BZX84	5 % 12 V 0.3 W SOT23
D130	4375060	IC, MCU		PLCC44
D131	4309914	IC, 6 x sch.inv	74HC14	SO14
N100	4305236	IC, 2 x comp.	LM2903	SO8S
N110	4301199	IC, 2 x op.amp.	LM2904	SO8S
N230	4300269	IC, 2 x op.amp.	TL064ID	SO14
N250	4303439	IC, af amp4w/14v 4–20v dil	TDA1904	DIL16S
N270	4301062	IC, regulator	LP2951AC	SO8S
N310	4309488	IC, 4 x bi.switch	74HC4066	SO14S
N320	4309488	IC, 4 x bi.switch	74HC4066	SO14S
X170	5416517	Modular jack 8 pin pcb		
X210	5439668	Connector 2x2pole right angle pc		PCB
X230	5407002	Jack 2,5mm horizo female pcb		
X250	5407006	Jack 3,5mm horizo female pcb		
X290	5401050	Modular jack 10 shielded pcb		
	7510302	Adhesive stick jet–melt tc–3748		
	9853993	PCB BC4B 114.3X79.5X1.6 D 2/PA		
	9853993	PC board	BC4B	114.3x79.5x1.6 d 2/pa

C295	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C296	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C297	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C298	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C310	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C311	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C313	2310738	Ceramic cap.	4.7 n	20 % 50 V 0805
C340	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C341	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C342	2310791	Ceramic cap.	33 n	20 % 50 V 0805
L100	3607555	Coil		2 A d17x12mm
L101	3607555	Coil		2 A d17x12mm
L102	3607555	Coil		2 A d17x12mm
L161	3606946	Ferrite bead 0.2r 26r/100mhz 1206		1206
L210	3607898	Choke		2 A 900UH/1 kHz DH–TS582
B130	4501008	Crystal	7.3728 M	16PF 50PPM
V101	4215954	MosFet	RFD14N05	n–ch 50 V 10 A TO252
V102	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V103	4200909	Transistor	BC858B/BCW30	pnp 30 V 100 mA SOT23
V104	4107160	Zener diode	BZX84	5 % 12 V 0.3 W SOT23
V105	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V106	4200909	Transistor	BC858B/BCW30	pnp 30 V 100 mA SOT23
V107	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V108	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V109	4110022	Schottky diode	EC20QS06	60 V 2 A 5x2.5x2mm
V131	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V132	4106769	Zener diode	BZX84	5 % 4.7 V 0.3 W SOT23
V133	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V134	4106769	Zener diode	BZX84	5 % 4.7 V 0.3 W SOT23
V135	4106769	Zener diode	BZX84	5 % 4.7 V 0.3 W SOT23
V190	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V191	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V192	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V193	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V194	4101653	Diode	BYD17D	200 V 1.5 A SOD87
V195	4101653	Diode	BYD17D	200 V 1.5 A SOD87
V212	4100218	Trans. supr.	LDP24A	100 V 30A/40 ms AG
V213	4200603	Transistor	BCX17	pnp 45 V 500 mA SOT23
V214	4200603	Transistor	BCX17	pnp 45 V 500 mA SOT23
V215	4110195	Zener diode	BZX84	5 % 18 V 0.3 W SOT23
V216	4200603	Transistor	BCX17	pnp 45 V 500 mA SOT23
V217	4108639	Diode x 2	BAS28	75 V 250 mA SOT143
V218	4202456	MosFet	IRFR9020	p–ch 50 V 8 A TO252
V219	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V230	4110117	Zener diode	BZX84	5 % 3.9 V 0.3 W SOT23
V270	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23

C133	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C134	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C135	2310343	Ceramic cap.	22 p	5 % 50 V 0805
C136	2310343	Ceramic cap.	22 p	5 % 50 V 0805
C137	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C138	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C139	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C140	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C143	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C144	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C170	2310738	Ceramic cap.	4.7 n	20 % 50 V 0805
C171	2310738	Ceramic cap.	4.7 n	20 % 50 V 0805
C172	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C173	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C174	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C175	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C177	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C190	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C191	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C213	2501605	Electrol. cap.	100 u	20 % 35 V RM3.5
C214	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C215	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C216	2507479	Electrol. cap.	1000 u	20 % 25 V 13x20mm
C217	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C220	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C221	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C230	2310463	Ceramic cap.	220 p	5 % 50 V 0805
C231	2604022	Tantalum cap.	0.1 u	20 % 35 V 3.2x1.6x1.6
C233	2310463	Ceramic cap.	220 p	5 % 50 V 0805
C234	2310505	Ceramic cap.	470 p	5 % 50 V 0805
C235	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C250	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C251	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C252	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C253	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C254	2404094	Polyester cap.	470 n	10 % 63 V RM5
C256	2505261	Electrol. cap.	220 u	20 % 25 V 8.5x11.5
C257	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C258	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C259	2310544	Ceramic cap.	1.0 n	5 % 50 V 0805
C270	2604127	Tantalum cap.	1.0 u	20 % 35 V 3.5x2.8x1.9
C271	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C272	2604127	Tantalum cap.	1.0 u	20 % 35 V 3.5x2.8x1.9
C273	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C291	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C293	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C294	2310488	Ceramic cap.	330 p	5 % 50 V 0805

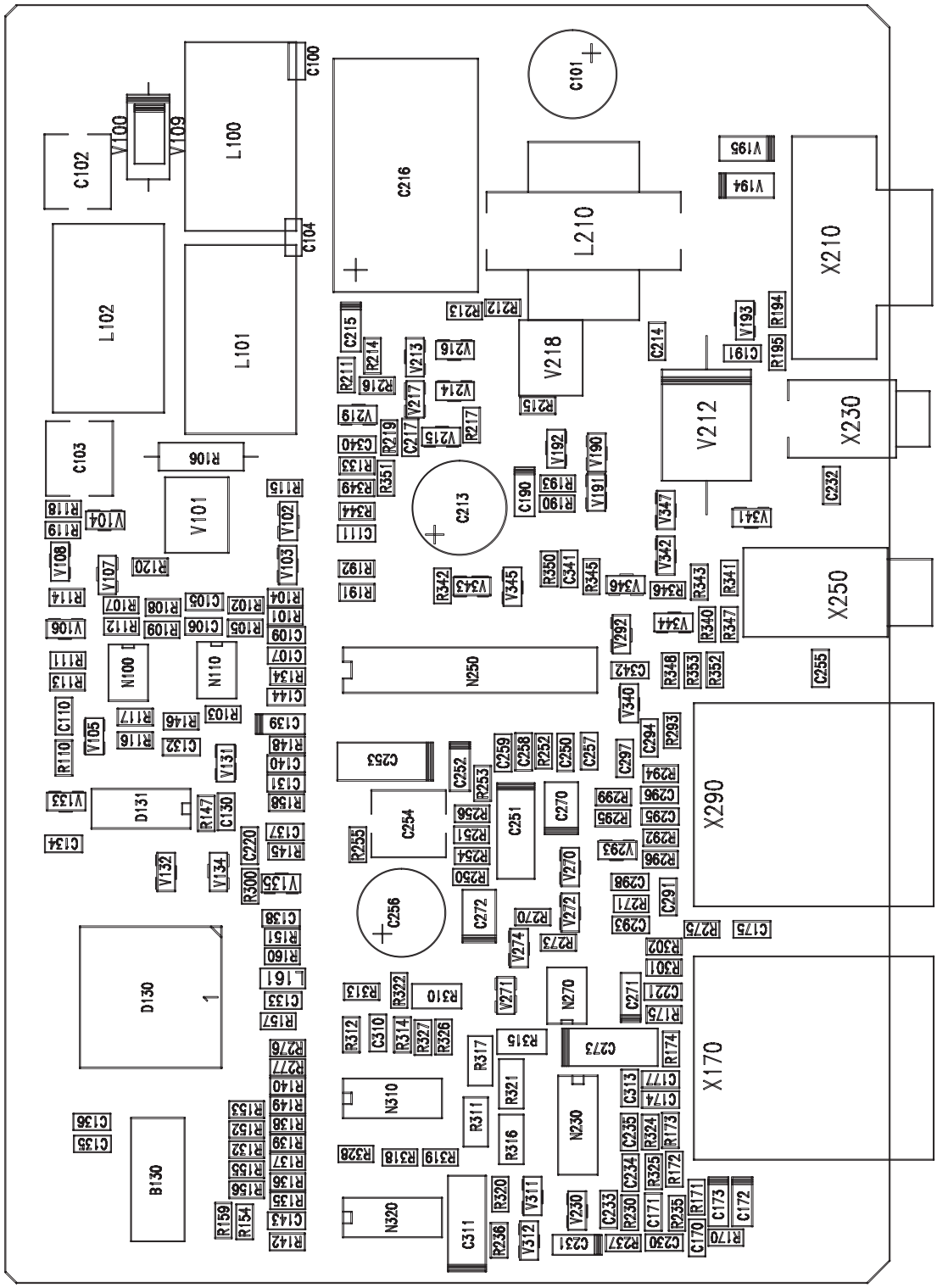
R302	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R310	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R311	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R312	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R313	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R314	1414212	Chip resistor	330 k	5 % 0.1 W 0805
R315	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R316	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R317	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R318	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R319	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R320	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R321	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R322	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R324	1413642	Chip resistor	56 k	5 % 0.1 W 0805
R325	1413642	Chip resistor	56 k	5 % 0.1 W 0805
R326	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R327	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R328	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R340	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R341	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
R342	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R343	1412729	Chip resistor	33 k	5 % 0.1 W 0805
R344	1412536	Chip resistor	22 k	5 % 0.1 W 0805
R345	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
R346	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R347	1413716	Chip resistor	220 k	5 % 0.1 W 0805
R348	1413723	Chip resistor	470 k	5 % 0.1 W 0805
R349	1412536	Chip resistor	22 k	5 % 0.1 W 0805
R350	1412729	Chip resistor	33 k	5 % 0.1 W 0805
R351	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R352	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R353	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
C100	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C101	2505261	Electrol. cap.	220 u	20 % 25 V 8.5x11.5
C102	2404094	Polyester cap.	470 n	10 % 63 V RM5
C103	2404094	Polyester cap.	470 n	10 % 63 V RM5
C104	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C105	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C106	2310738	Ceramic cap.	4.7 n	20 % 50 V 0805
C107	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C109	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C110	2310488	Ceramic cap.	330 p	5 % 50 V 0805
C111	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C130	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C131	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C132	2310791	Ceramic cap.	33 n	20 % 50 V 0805

R159	1412729	Chip resistor	33 k	5 % 0.1 W 0805
R160	1413829	Chip resistor	10	5 % 0.1 W 0805
R170	1412261	Chip resistor	100	5 % 0.1 W 0805
R171	1412261	Chip resistor	100	5 % 0.1 W 0805
R172	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R173	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R174	1412303	Chip resistor	330	5 % 0.1 W 0805
R175	1412303	Chip resistor	330	5 % 0.1 W 0805
R190	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R191	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R192	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R193	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R194	1413804	Chip resistor	1.0 M	5 % 0.1 W 0805
R195	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R211	1413716	Chip resistor	220 k	5 % 0.1 W 0805
R212	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R213	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R214	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R215	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R216	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R217	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R219	1412729	Chip resistor	33 k	5 % 0.1 W 0805
R230	1414212	Chip resistor	330 k	5 % 0.1 W 0805
R235	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R236	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R237	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R250	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R251	1413829	Chip resistor	10	5 % 0.1 W 0805
R252	1412729	Chip resistor	33 k	5 % 0.1 W 0805
R253	1412536	Chip resistor	22 k	5 % 0.1 W 0805
R254	1413829	Chip resistor	10	5 % 0.1 W 0805
R255	1412536	Chip resistor	22 k	5 % 0.1 W 0805
R256	1412303	Chip resistor	330	5 % 0.1 W 0805
R270	1414212	Chip resistor	330 k	5 % 0.1 W 0805
R271	1413804	Chip resistor	1.0 M	5 % 0.1 W 0805
R273	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R275	1413804	Chip resistor	1.0 M	5 % 0.1 W 0805
R276	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R277	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R292	1412303	Chip resistor	330	5 % 0.1 W 0805
R293	1412303	Chip resistor	330	5 % 0.1 W 0805
R294	1412303	Chip resistor	330	5 % 0.1 W 0805
R295	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R296	1412261	Chip resistor	100	5 % 0.1 W 0805
R299	1413716	Chip resistor	220 k	5 % 0.1 W 0805
R300	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R301	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805

Parts List BC4B (Version 2.1) Code: 0200180

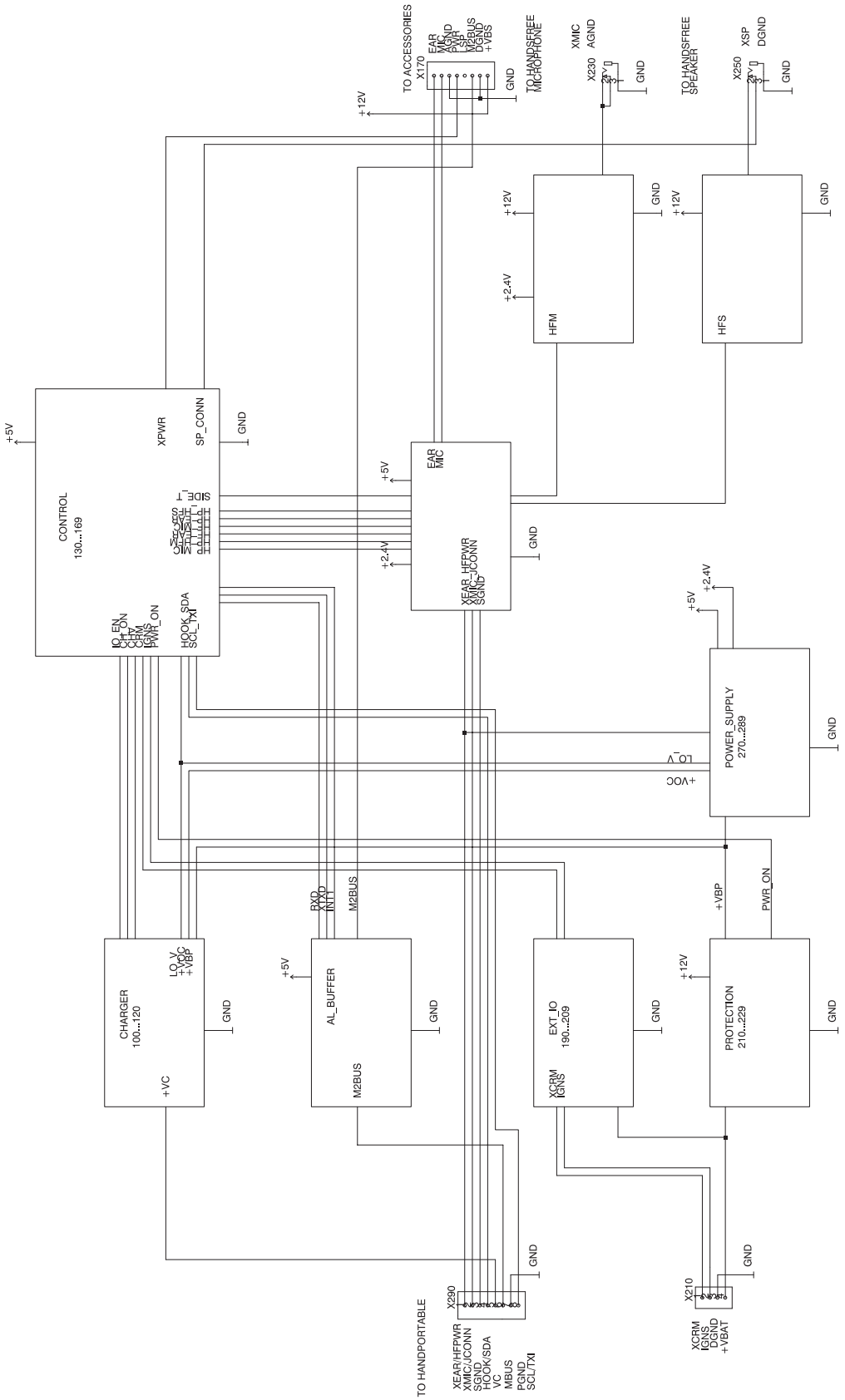
ITEM	CODE	DESCRIPTION	VALUE	TYPE
R101	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R102	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R103	1414212	Chip resistor	330 k	5 % 0.1 W 0805
R104	1412511	Chip resistor	18 k	5 % 0.1 W 0805
R105	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R106	1400844	Melf resistor	0.33	2 % 0.7 W 6.5x2.5
R107	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
R108	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R109	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R110	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R111	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R112	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
R113	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
R114	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R115	1411669	Chip resistor	22	5 % 0.1 W 0805
R116	1412536	Chip resistor	22 k	5 % 0.1 W 0805
R117	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R118	1412416	Chip resistor	2.2 k	5 % 0.1 W 0805
R119	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R120	1412310	Chip resistor	470	5 % 0.1 W 0805
R132	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R133	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R134	1413804	Chip resistor	1.0 M	5 % 0.1 W 0805
R135	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R136	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R137	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R138	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R139	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R140	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R142	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R145	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R146	1413804	Chip resistor	1.0 M	5 % 0.1 W 0805
R147	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R148	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R149	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R151	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R152	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R153	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R154	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R155	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R156	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R157	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R158	1413804	Chip resistor	1.0 M	5 % 0.1 W 0805

Layout Diagram of BC4B (Version 04)



Circuit Diagram

Block Diagram



Microphone Amplifier

Handsfree microphone signal is amplified in N230, and directed to handportable XMIC line or accessories MIC line in audio switch block. The accessory supply voltage +VBS must be turned on when this amplifier is used, because it is supply voltage for this block too.

Signals Passed between the Mic. Amp. Block & Other Blocks:

Name	Description
HF_MIC	Amplified hands free microphone output signal to audio switch –block.
+12V	Supply voltage.
+2.4V	Internal d.c. level reference.
X290.2	Hands free microphone input.
GAIN	Gain selection input, low level at this input gives higher gain.

Speaker Amplifier

This is 4 W power amplifier for hands–free loudspeaker. Audio signals from handportable XEAR or accessories EAR lines are directed in audio switch block to speaker amplifier N250. The gain is constant. The accessory supply voltage +VBS must be turned on when this amplifier is used, because it is supply voltage for this block too.

Signals Passed between the Speaker Amp. Block & Other Blocks:

Name	Description
+12V	Supply voltage.
+2.4V	Internal d.c. level reference.
HF_SP	Hands–free speaker input.
X250.2	Hands–free speaker output.

External I/O

This block consists of car ignition key sense and car radio mute. When pin 2 at connector X210 is connected to car battery voltage, an interrupt pulse for processor is generated. If processor is in power down mode it wakes up. Processor can also read ignition key state. In power on mode this state is continuously polled, and an mbus message is send to hand-portable, when this state changes.

Car radio mute is an open collector output capable of driving a relay. The purpose is to mute car radio during conversation. This output has a short circuit protection, which is triggered when pin 1 at X210 is directly connected to car battery voltage, while the output is turned on. When triggered output turns and stays off, until it has been turned off and on again.

Signals Passed between the Ext. i/o Block & Other Blocks:

Name	Description
IGNS pulse	Car ignition key status to processor and interrupt generator.
CRM	CRM on/off control from processor.
X210.2	IGNS input in connector X210.
X210.1	CRM output in connector X210.

Power Supply

This block provides +5 V supply voltage for processor and +VCH voltage for charger. When xear/hfpwr line is connected to ground via 100 kΩ resistor +5V voltage turns on. When +5 V is turned on, processor can control +VCH.

When supply voltage from car battery is too low or for some other reasons regulator N270 can’t give proper +5 V voltage, it gives an error signal. This error signal is used to disable charger and as a reset signal for processor.

Signals Passed between the Power Supply Block & Other Blocks:

Name	Description
+VBP	Protected car battery voltage, supply voltage for this block.
+VCH	Charger supply voltage.
HFPWR	Power on/off control.
+5V	+5V supply voltage, output of this block.
LO_V	Low voltage error indication.

Signals Passed between the Charger Block & Other Blocks:

Name	Description
+VPB	Supply voltage for power section
+VCH	Supply voltage for oscillator and comparators
CH_ON	On/off control
LO_V	Low voltage turn off
IO_EN	Reference voltage +5 V
+VC	Output voltage/current
PGND	Ground for output (”power ground”)

Audio Switches

Audio paths are controlled by seven CMOS analog switches N320 and N310. Paths for microphone and ear/speaker signals between handportable and accessories, handportable and hands–free, hands–free and accessories are possible. XEAR and XMIC lines from the handportable includes a differential buffer amplifiers N230. Both audio paths have d.c. decoupling capacitors. Internal d.c. levels are 2.4 V.

Signals passed between the audio switch block and other blocks:

Name	Description
HP_HFS	See description of control block
HP_EAR	”
HF_MIC	”
HF_EAR	”
HP_HFM	”
HP_MIC	”
+2.4V	Internal d.c. levels
+5V	External d.c. levels
SIDE_T	Sidetone on/off
XEAR/HFPWR	Received audio signal from handset
XMIC/JCONN	Transmitted audio signal to handset
MIC	Audio signal to/from accessories
EAR	Audio signal to/from accessories

Signals Passed between the Control Block & Other Blocks are:

Name	Description
PWR_ON	Accessory power switch on/off.
CH_ON	Charger on/off.
SCL/TXI	IIC bus clock for booster/booster error indication.
IO_EN	Voltage for several pull–up resistors (see circuit diagram). In power down mode this signal is low level, to reduce current consumption.
XPWR	Handset's power on switch state.
IGNS	Car ignition switch state.
RXD	Mbus receive data.
TXD	Mbus transmit data.
CRM	Car radio mute
HP_MIC	Audio switch control between handportable's xmic and accessories mic
HP_HFM	Audio switch control between handportable's xmic and handsfree microphone
HF_EAR	Audio switch control between accessories ear and handsfree speaker
HF_MIC	Audio switch control between accessories mic and handsfree microphone
HP_EAR	Audio switch control between handportable's xear and accessories ear
HP_HFS	Audio switch control between handportable's xear and handsfree speaker
SIDE_T	Sidetone from X170 MIC to EAR control.
CHV	Charger voltage control, 12 or 15 V.
LO_V	Low voltage indication. Generates reset for processor.

Charger

The charger is a switching mode voltage/current source. Switching frequency is fixed at approx. 80 kHz, generated by a separate RC oscillator. The charger has voltage and current feedback. At a light load (less than 800 mA current), the charger acts as a 12 V (or 15 V) voltage regulator; with a heavier load, it acts as a 800 mA current regulator. Input voltage can be higher or lower than the output voltage.

7	XMIC/JCONN	Audio signal from accessories or HF microphone to HP. 100 kΩ pull–up to +5 V; d.c. level indicates connection of HFJ–3 box to HP.
8	XEAR/HFJPWR	Audio signal from handportable (received audio) to accessories or HF speaker. 1 MΩ pull–up resistor to +VBAT. Drop down of current from this pin turns on +5 V supply to processor.

Functional Description

The BC4 module can be divided into seven blocks as follows:

– control
– charger
– audio switches
– external I/O
– power supply
– microphone amplifier
– speaker amplifier

Control Block

Main parts of the control block are microcontroller D130 (83C51FA), mbus, and interrupt logic. D130 controls the audio paths, the charger, external I/O, the booster interface and the accessory power switch.

Interrupts are obtained from three sources: car ignition switch, handset's power switch, and mbus. Their purpose is to wake up the controller from power down mode. Mbus is the interface between the handportable and other accessories except the booster. There are bidirectional buffer in mbus line, which regenerates the mbus signal.

Booster Interface (used only with NHC–1/3)

Tuning values from booster EEPROM are read immediately after power on (handportable is connected to holder or wake up from power down). It is possible to read EEPROM values via mbus request, but it should not be done during conversation.

If booster EEPROM data and checksum are correct, tuning values are send to the handportable and SCL/TXI line polling begins. If low level is detected handportable is informed via mbus message. SCL/TXI line can be used as output at the same time and controlledby mbus messages. If no message is sent output state is ”high”. Periodically SCL/TXI is changed to input and its state is read. This polling causes pulses, whitch must be filtered in booster.

Accessory Connector X170

Pin	Name	Description
1	+VBS	Power supply for accessories; HFJ–3 turns this voltage on and off under handportable control.
2	DGND	Digital ground.
3	M2BUS	Serial mbus data between handset, HFJ–3 and accessories.
4	LSP	Not connected.
5	PWR	This signal is pulled to +5 V at HFJ–3 via internal resistor. Indicates external handset power on switch state to HFJ–3 box.
6	AGND	Analog ground.
7	MIC	Audio signal from accessories to hand portable (transmitted audio) or HF speaker (voice dialer phrase, answer machine message).
8	EAR	Audio signal from handportable (received audio) or from HF microphone to accessories.

Handportable Connector X290

Pin	Name	Description
1	SCL/TXI	IIC bus clock for booster; this signal is pulled to +5 V at HFJ–3 via internal resistor of processor. This pin is also used booster error indication; in error condition, booster pulls this pin down. This pin can be used as output to booster at the same time. Periodically this pin is changed to input for 60 µs time and TXI state is polled. These polling pulses must be filtered in booster.
2	PGND	Ground for charger.
3	M2BUS	Serial mbus data between handportable (HP), HFJ–3 and accessories.
4	VC	Supply voltage/charging current for HP.
5	HOOK/SDA	Handset hook ind./IIC bus data for booster.
6	SGND	Signal ground.

External Signals and Connections

The module is provided with five external connectors: power supply connector, external microphone connector, external speaker connector, hand-portable connector, and accessory connector.

Power Supply Connector X210

Pin	Name	Description
1	XCRM	External car radio mute. open collector output; when muted, state at this output is pulled down, when not muted this output is in high impedance state. Load relay should be connected between this pin and +Vbat. – on state max. voltage: +1 V – on state max. current: 250 mA – off state max. current: 1 mA – load resistance min.: 64 Ω
2	IGNS	Input controlling auto power off function. Should be connected to car ignition switch (after switch) when in use and to ground when not in use.
3	GND	Power supply ground, should be connected to car battery negative terminal.
4	+VBAT	Power supply voltage, should be connected to car battery positive terminal.

External Microphone X230

Pin	Name	Description
1	GND	Ground for external microphone.
2	HFMIC	Supply voltage for microphone / audio signal from microphone.

External Speaker X250

Pin	Name	Description
1	GND	Ground for external speaker.
2	HFSP	Audio signal to speaker/speaker indication d.c. signal.

Booster Interface (used only with NHC–1/3):

When requested via mbus message, HFJ–3 can read booster tuning values from booster EEPROM and send them to the handportable. Tuning values can also be written to booster EEPROM.

Technical Specifications

Modes of Operation

Power Off Mode

The battery voltage is always connected to accessory and charger power switches. The rest of the circuitry does not receive supply voltages.

Power Down Mode

+5 V supply voltages are switched on. The processor is in power down mode and its clock oscillator is not running.

Power On Mode

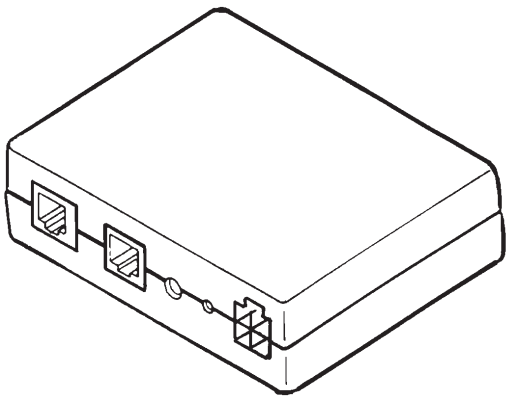
The processor is executing code. +5 V supply voltages are on and other supply voltages are under processor control.

HF Junction Box HFJ–3

Introduction

The HFJ–3 hands–free junction box provides and controls the supply voltages for the accessories and charge current for the handportable. In addition, it controls the audio paths to accessories and hands–free equipment.

The unit contains a protection circuit against battery voltage transients, power switch, hands–free speaker and microphone amplifiers, audio switches, external I/O, switch mode charger and a microprocessor which communicates with the handportable via the mbus interface.



Main Features

Accessories Supply Voltage

Filtered and switched voltages are supplied to peripheral devices and to hands–free audio parts in the HFJ–3 box. Protection against disturbances, as overvoltages, transients in incoming battery voltage.

Audio Switches

Controls audio paths between handportable, hands–free equipment and accessories.

Handsfree Audio Amplifiers

External microphone and speaker amplifiers for hands–free operation.

Charger

Provides supply voltage and charge current for handportable.

External I/O

Open collector output, capable of driving an external relay.

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After Sales Technical Documentation

HF Junction Box
HFJ–3

Original 50/96

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